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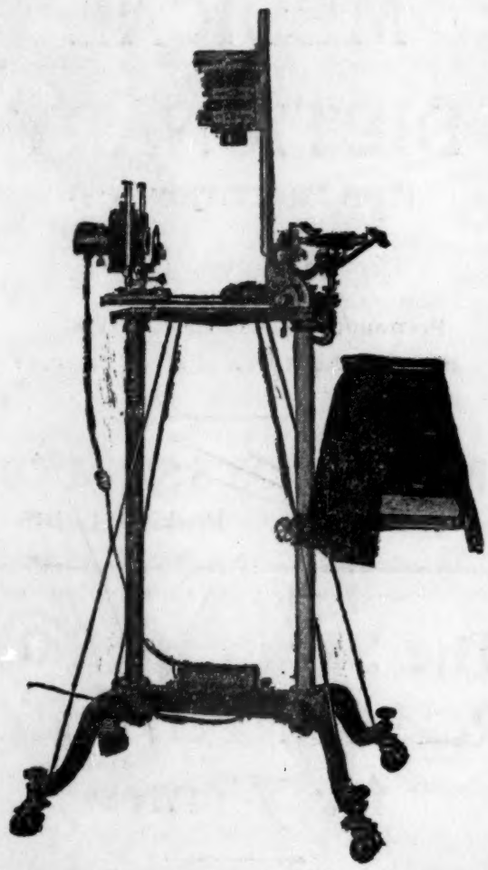

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# SCIENCE

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## THE MODERN SYSTEMATIST[1]

WE are still engaged in exploring the earth, that we may understand it. We can not understand any part of the surface of the earth until at least three persons have studied the area carefully: the geologist, the physiographer, the recording biologist. We shall never cease to explore the earth, in old places as well as new. We can never dispense with the recorders.

The older systematic zoology and systematic botany fell into disrepute with the competition of the exacter studies in morphology and physiology, and they have been overshadowed by the interest centering in evolution and its derivative subjects. On the botanical side, the naming of specimens as an exercise in education in schools and the making of a so-called herbarium of snips of plants, have still further discredited whatever seems to be related to systematic work.

Although it is not the purpose of this paper to discuss the educational aspects of the subject, it may nevertheless be said that, so far as one can determine, this school herbarium work did not make botanists, on the one hand, nor lead to an appreciation of nature, on the other, and it would be difficult to trace contributions to science from its suggestion. As an educational method it was faulty because it did not connect plants with either function or environment, nor call for continued application on the part of the pupil. The intensive laboratory course that succeeded it developed exacter methods, more sustained

[1] Before National Academy of Sciences, Philadelphia, November 20, 1917.

application, closer scrutiny or observation and related the exercises to function. It has failed, however, in not educating in terms of the vegetable kingdom. We now see that the best educational procedure for botany in schools is a good combination of intensive laboratory work indoors, with carefully planned field and systematic work. The field naturalist contributes the factor of leadership in addition to drill with subject-matter; under his care, the environment of both men and other organisms begins to express itself. This, of course, is as true in zoology as in botany; in fact, good field work is both zoology and botany. This kind of field and collecting work provides the best approach to nature. To know a cell or a spore is of much less significance to the major part of mankind than to know a plant.

Some of the disdain of descriptive and taxonomic effort is due to the feeling, which is not without justification, that much of the so-called systematic work is little more than the personal naming and re-naming of specimens, without the addition of new knowledge or the expression of new meanings; the work is therefore likely to be disregarded, as irrelevant and not worth the while.

The systematist has also lost sympathy with many of his compeers because of the controversies over nomenclature. The impression has gone abroad that he deals only with names. The controversies in this field issue from two mistaken premises on the part of nomenclatorialists—the assumption that nomenclature can be codified into invariable law, and the practise of making rules retroactive. Varying practises in language tend in these days toward agreement and unification, the persisting variations being mostly in minor matters; as soon, however, as any superimposed authority undertakes to enforce rigidity, rebellion is invited and differences are likely to be organized into counter codifications. It is probably not even desirable to have rigidity in binomial nomenclature for plants. The reactionary nature of the rules is their greatest fault, however, and is responsible for most of the mischief. It upsets good practise, on which the literature rests, even as far back as Linnæus. Acts of legislatures, regulations of government, ordinances, entrance requirements to colleges and other enactments, become operative at a specified future date. The names of plants are vested rights to the users of them in literature, and there is no moral warrant for changing those of times past merely that they may conform to a rule of the present. If the practise were in the realm of enacted law involving property, any court would declare it illegal. I introduce this discussion to say that the changes in nomenclature are not a necessary part of systematic work except in so far as they result from changed biological conceptions of genera and species.

### THE WORK OF THE SYSTEMATIST

With this preface, I may enter my subject, which is the place of the systematist in present-day natural history. I shall naturally speak in terms of plants, but I trust that some of you will make the extension to terms of animals.

To know the forms of life is the primary concern of the biologist. This knowledge is the basis of all study in morphology, physiology, heredity and phylogeny. Undoubtedly much of the looseness of statement and incorrect inference in writings on variation and heredity are due to the very inexact definition of the forms about which we talk. Much of the *non sequitur* lies here. Literature is undoubtedly full of examples. Every discouragement of the

systematist reacts on the conclusions of those who cite the names of plants.

So fundamental is this contribution of the systematist that we should now be very cautious in talking of heredity in plants at all until we have redefined their forms. The records of variation, as such, do not constitute definitions, but only departures from assumed norms.

The definitions of the systematist, who critically surveys a wide range of material for comparison rather than for divergence, apply not only to the assemblages we know as species, but also to the minor forms that seem to have descriptive unity. If I were now working with any group of plants in an experimental way touching development and evolution, I should want first to turn the whole group over to a conservative systematist for careful review.

I had hoped that, in the beginning of the plant-breeding studies, the breeder would also be a pronounced systematist that he would aid us in the definition of the forms of plants, and bring his experimental studies to bear in tracing the probable course of evolution up to this epoch, that is, that he would contribute more freely to the knowledge of origins. I still think that we shall find the experimenter relating his work more closely to systematic botany as soon as the systematist takes cognizance of the plant-breeder, and the plant-breeder is satisfied that he must analyze his measurements in terms of biological definition and classification. I doubt the adequacy of some of the biometrical computation, and I regret the frequent neglect of herbarium studies whereby vegetation-factors rather than measurement-factors may be strongly emphasized.

It is not unlikely that the ecologist falls into false comparisons by carelessness in identification, or by inattention to critical differentiations. It really matters very much whether a given distribution represents one specific type, or two or more very closely related types; in fact, the significance of an ecological study may depend directly on allied taxonomic relationships.

Certain phases of the intermediate field between taxonomy and genetics I discussed two years and more ago in this city before the American Philosophical Society, and suggested a definite program of combined systematic and experimental work; therefore I shall not enlarge on this subject here, although it merits further attention. It may be noted in passing, however, that the more enthusiastic definition of forms demands a refined and more exact art of phytography, and it should lead also in the direction of classification. The marked variations may well find place in a taxonomic treatment rather than to be studied merely as separates. The remarkable mutations of *Nephrolepis*, for example, afford excellent material for systematic descriptive study.

Much of the earth is yet to be explored for the forms of life. There are fertile regions yet untouched. One collection in Papua yielded some 1,100 new orchids. Remarkable collections of novelties continue to come to our herbaria, many of them from regions not very remote. Not nearly all the plants of the globe are known. The systematist must continually be better trained, for he has the task of understanding the older accumulations as well as adjudging the new. He makes increasing contributions to plant geography and distribution, and gives us an enlarged judgment on the character of the countries of the earth as indicated by their vegetation. In fact, we never understand a country before we know its plant life. The contributions made recently by Forrest, Wilson, Purdom and others to the geography

and resources of western China are good examples.

Yet it is in the old regions as well as in the new that novelties still come to the hand of the systematist. Every edition of the manuals of the plants of the northeastern United States, for example, contains large additions. These acquisitions are in some part the result of new introductions, running wild; in an important part the discovery of species heretofore overlooked; in large part, also, the results of redefinition, known as "splitting" of species.

This splitting is not alone the result of a desire to "make new species," but is the operation of a new psychology. In everything we are rapidly becoming particularists. In the time of Gray we studied plants as aggregates, trying to make them match something else; now we study them as segregates, trying to make them differ from everything else. This diversity in process accounts for the extension of *Œnothera, Carex, Rubus, Malus, Cratægus.* Whatever may be said of the relative ranks of the newly described species in a scheme of coordination, we should thereby nevertheless understand the forms better than heretofore and refine both our discrimination and our definition. Probably we do not yet really understand any one of the more representative genera of plants of the northeastern United States.

In making these remarks I am not commending the practise of those who would divide and redivide minutely, and who would carry descriptive botany to such a point of refinement that only the close specialist can know the forms. Under such circumstances, systematic work defeats its own ends.

It is, after all, to the plants of the older lands that the systematist must constantly bring his closer observation, new measurements, accumulation of facts, keener judgments, truer interpretation of environment, profounder estimation of relationships that can be expressed by classification. He is not merely a describer of novelties, giving new names; he discriminates, re-defines, applies the results of latest collateral science, suggests new meanings. His studies, as any others, must be kept alive and up to date. He must continually better serve any student of plants. There is no more end to the work of the systematist than to that of the geneticist.

Every large or variable group needs to be reworked at least every twenty-five years. In fact, it is an advantage to have a group worked simultaneously by separate monographers, that we may have more than one method and more than one judgment brought to bear on the problem. We must outgrow the idea that there is any finality in even the best monograph. Frequent review and sifting of evidence are as necessary in systematology and taxonomy as in morphology.

We do not realize that there is now appearing the modern systematist, who is not an herbarium hack, but a good field man, an evolutionist and plant geographer, one highly skilled in identification, and reinforced by much collateral training of a highly specialized character. This man has come quite unaware to most of us. Among the phytographers are those who are primarily cataloguers, sorters and bibliographers, of great skill; but the real systematist is a highly trained scientist.

I regret that the contribution of this man is frequently so little evidenced in the processes of college teaching. Graduates may be sent forth to instruct in botany so innocent of kinds of plants and of the means of finding them out as to be lost when placed in a strange country, wandering blankly among the subjects they are supposed to teach.

I have said that the systematist is specially needed in the older lands. I wish now to press this remark still farther by saying that he is much needed in the oldest and best known genera. What are known as the older species, as well as older genera, are likely to be least understood, for knowledge becomes traditional and they pass unchallenged. It is exactly in the old and supposedly well-known species that we are now making so many segregates.

It may be difficult, in any given monography, to express these different aptitudes of the systematist. Some subjects or problems do not exhibit the features that I have suggested nor admit of the application of such broad and deep investigations, even though the study and publication of them may be very much worth doing. Yet, the field of systematic work may be indicated, as an aim.

THE SITUATION IN THE CULTIVATED FLORA

No plants go unchallenged so completely as those of widespread, common and ancient cultivation. The treatment of them is particularly traditional. There may be no "types" representing them in herbaria. Origins may be repeated, perhaps even from the days of the herbalists. Statements are passed on from book to book and generation to generation. The plants are taken for granted. Yet when we come to study them critically we find that they may contain "new species," those that have passed all this time unrecognized. Any field that has been long neglected is sure to yield new harvests. The cultivated plants now provide some of the best botanizing grounds.

A few examples will illustrate what I mean. As a very simple illustration I may cite the case of the plant cultivated as *Malvastrum capense*. The species (as *Malva capensis*) was founded by Linnæus. The description in the books has been correct; but when the horticultural material was critically examined in 1908 it was found be an unrecognized new species, although cultivated for more than a century. It is now named *Malvastrum hypomadarum* Sprague. Another new species has recently been separated by Sprague in the material commonly grown in greenhouses as *Manettia bicolor*. The cultivated stock is clearly of two species, *M. bicolor* being Brazilian, and the new *M. inflata* being Paraguayan and Uraguayan. A case may be cited also in one of the commonest abutilons. The plant grown as *A. striatum* Dicks, is found to be really *A. pictum* Walpers, with the true *A. striatum* probably not in cultivation; and part of the greenhouse material, long cultivated, was separated as a new species, *A. pleniflorum*, as late as 1910 by N. E. Brown. Moreover, the plant still grown as *A. Thompsonii* is found to be not that plant, the material now cultivated in England under that name being recently described as *A. striatum* var. *spurium*, and that in America being apparently of several unidentified forms. In the meantime, the original *A. Thompsonii* appears to have been practically lost. Now, this situation directly involves the integrity of the so-called bigeneric graft-hybrid *Kitaibelia Lindemuthii*, one of the parents of which is recorded as *Abutilon Thompsonii*.

These are cases of erroneous determination and of confusion in forms, representing one of the commonest kinds of puzzles in the study of cultivated plants. The difficulty lies in the fact that systematists have not taken the trouble to look the cases up, accepting the plants from literature, and also in the fact that herbaria usually do not adequately represent such plants. The student may search in vain for authoritative early material of most long-cultivated plants, even in the best herbaria.

One of the present necessities is to collect the cultivated plants in their different forms from many localities, and representing the stocks of different dealers, in precisely the same spirit in which feral plants are taken for herbaria. Without such sources of information, we can neither understand the systematology of the plants themselves or bring the best aid to the student of heredity.

[The speaker here mentioned the lack of record material in studies of the systematology of *Coleus* and other groups; and explained also the unsatisfactory practise on which descriptions of large numbers of cultivated species still must rest.]

Excellent illustration of the confusion in cultivated plants, even of relatively recent introduction, is afforded by the velvet-beans now grown in the southernmost states. These plants have been referred indiscriminately to *Mucuna pruriens*, long cultivated in the tropics. On careful recent study, however, the American planted material is found to be so different from *Mucuna* as to necessitate generic separation, and the genus *Stizolobium* has been revived to receive it. The common cultivated velvet-bean is found by Bort to be an undescribed species, probably of oriental origin, and it has been named and described *Stizolobium Deeringianum*. Subsequently other species have been newly described in the cultivated stocks. One need not go far for many comparable illustrations of the confusion in which cultivated plants have lain. Americans are now specially active in resolving these complexities. As a running random comment may be cited the work of Rose in the cacti, Swingle in *Citrus*, Rehder in *Wisteria*, oriental *Pyrus* and others, Wilson in Japanese cherries, Safford in Annonaceæ. It is not too much to say that any of the important groups of cultivated plants will fall to pieces as soon as touched by the competent modern systematist.

The systematist who works in these domesticated groups must first make large collections of new information and material. It is becoming a habit with him to travel extensively to study the plants in their original countries, and to bring history and ethnography to bear on the problem. He is not content until he arrives at sources.

[The speaker discussed, and illustrated with herbarium material, the recent studies in the cultivated poplars, whereby the subject has been opened for discriminating investigation.]

Nor does the confusion lie only with plants of ancient domestication or with those native to countries which have not yet been well explored. The horticultural blackberries have been brought into cultivation from American wild stocks within seventy-five years or less, they have been accorded careful study by several specialists, yet no one is ready to name the species from which the different forms have come. A number of systematists are working on them, and yet they are in need of further study, both in the wild and in cultivation. In *Prunus* is a comparable case, horticultural forms in many named varieties of native plums having come into cultivation within fifty years. It fell to my hand to attempt the first critical taxonomic writing of these native plants, in 1892; but in 1915 Wight completely recast the treatment, in the light of accumulated experience. This illustrates my earlier remark that every group should be newly monographed at frequent intervals.

Perhaps we do not sufficiently realize the great numbers of species of plants now in cultivation. We may have in mind the 247 species studied by DeCandolle in his

"Origin of Cultivated Plants." These are only food plants, and the treatment does not pretend to be complete. In the Standard Cyclopedia of Horticulture, the entries of plants described in cultivation exceeds 20,000, although not nearly all these species are domesticated. About 40,000 Latin names are accounted for. This treatment does not cover the cultivated plants of the world, but those of the United States and Canada and those readily drawn from the European trade, with the most prominent species in the island dependencies of the United States. Probably never have species new to cultivation been introduced so rapidly as within very recent years. For example, in the treatment of *Primula* in the Cyclopedia of American Horticulture in 1901, I described twenty-seven species; in the Standard Cyclopedia in 1916, I described 200. All this phalanx comprises in itself a large section of the vegetable kingdom, perhaps as much as nearly one sixth of the Spermatophyta, and it demands the attention of the best phytographic and taxonomic investigation.

The long-repeated statements of origins of cultivated plants are challenged whenever the systematology is seriously attacked, or when the subject is examined under botanical investigations. The case of maize is a striking example; although always explained on the basis of American origin, the reported pre-Columbian references in China need further investigation. The same kind of puzzle associates with many plants, wild as well as domesticated, that are prominent subjects in early travels and writings. Thus Fernald concludes that the wine-berries of the Norsemen were not grapes found on the shores of the present New England, as we have always assumed, and that they were probably mountain cranberries found in Labrador or the St. Lawrence region. The result of contemporaneous studies is that, from both the historical and biological sides, the foundations are being shocked. Most of my life I have given special attention to the botany of the domesticated flora, yet I should not now care to hazard a pronouncement from this platform on the specific natural-history origin of any one of the more important widespread species of cultivated plants.

### THE SYSTEMATIST IS A BIOLOGIST

Whether he works with feral or domestic floras, the systematist of whom I speak is a real investigator. He studies the living material so far as he is able, perhaps growing it for this purpose; tries to understand the influence of environment, the rôle of hybridization and mutation, and preserves his records in the form of ample herbarium sheets. He relates his work to morphology, and desires to arrange it as an expression of lines of development. He may study his material for years before he ventures to describe. It follows that the systematist necessarily, in these days, becomes a specialist; and it further follows that we should encourage, in addition to the few very large and comprehensive establishments, the making of many herbaria and growing collections strong in special lines.

L. H. BAILEY

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## PATENT REFORM PROSPECTS

THE Patent Office Society is permitted to announce that a composite committee has been created, upon request, by the National Research Council, to make a preliminary study of the problems of the U. S. Patent Office and its service to science and the useful arts. This committee, which is expected to meet in Washington shortly after the middle of December, is understood to comprise, at the outset, the following: Leo H. Baekeland, Wm. F. Durand, Thos. Ewing, Frederick P. Fish, Robert A.

Millikan, Michael I. Pupin and S. W. Stratton.

The action of the National Research Council in forming a committee of this sort is understood to be in conformity with the wishes of Commissioner of Patents J. T. Newton and Secretary of the Interior F. K. Lane, and to be in accord also with the following resolutions originally adopted by the Patent Office Society and concurred in by Mr. Ewing while commissioner of patents:

WHEREAS a section of the charter of the National Academy of Sciences provides that "The academy shall, whenever called upon by any department of the government, investigate, examine and report upon any subject of science or art,"

AND WHEREAS, at the request of the President of the United States, the academy has organized a National Research Council, to bring into effective cooperation existing governmental, educational and other research organizations,

AND WHEREAS the National Research Council is now perfecting its organization for the performance of the above duties,

AND WHEREAS a fundamental activity of the Patent Office is research upon questions of novelty, "in order to promote the progress of science and the arts" by the prompt issuance of proper grants and the refusal of improper grants of patent monopolies,

*Now therefore be it resolved by the Patent Office Society:*

1. That in its judgment a request for cooperation, advice and assistance should be promptly forwarded to the National Research Council, attention being called to such problems as adequacy of force, adequacy of space, adequacy of library, adequacy of facilities for test and demonstration, adequacy of classification, adequacy of organization, adequacy of scientific, legal and professional standards, adequacy of incentives and opportunities, simplification of procedure, responsiveness to present national and international requirements and to the important advances that might be expected either from an independent study of the above by the National Research Council or from an early effort on its part to coordinate, in the interest of an improved public service, the endeavors of the various national societies, manufacturing interests, patent bar associations, and all others aiming at genuine patent reform.

2. That the concurrence of the Commissioner of Patents and the Secretary of the Interior in these resolutions be solicited.

3. And that a copy hereof be forwarded to the National Research Council with some expression of the appreciation of this society for the interest already shown, and some appropriate assurance of the determination of this society to render every possible assistance and support to the work of the National Research Council.

The implied determination of the Patent Office Society to do its part in an effort to improve the work and conditions of the Patent Office, and to gain therein all possible support on the part of scientists, engineers and manufacturers, is further indicated in the accompanying resolutions relating to the proposed Institute for the History of Science, for which a Washington location is by it advocated—this latter proposal being already accorded the invaluable support of the Washington Academy of Sciences.

### RESOLUTIONS ADOPTED BY THE PATENT OFFICE SOCIETY, BY ITS AUTHORIZED EXECUTIVE COMMITTEE

That the attention of all interested in the possibilities of the proposed Institute for the History of Science be called to the advantages of such a location and organization for that institute, whenever it shall be established, as shall render its resources easily available not only to highly trained specialists but also to practising engineers, to examiners of patents, and, so far as practicable, to the general public.

That, in the judgment of the Patent Office Society, the present moment of prominence of American ideals and of recognized dependence upon the facts and principles of science is none too early for preliminary steps toward the establishment in this country of an Institute of the general character already proposed (by George Sarton, and others, in SCIENCE, March 23, 1917), such institute to be independent, liberally endowed and adequate not only to the requirements of our present national life, but also to that great era of internationalism and general enlightenment upon which even the avoidance of war may hereafter depend.

That the special committee in hand relations with the National Research Council be directed to emphasize to that body the foregoing conclusions as perhaps pertinent to purposes shared by it; to

solicit the concurrence therein of both the local and the national scientific and engineering societies, and to publish the same generally, or in its discretion, always with careful regard to the aims of those to whom the project is due.

The following questions raised in a report made to the Patent Office corps by a special committee charged to cooperate with the personnel committee of the National Research Council will indicate something of the tendency of measures for which it is hoped to gain early consideration:

What does the Patent Office need besides men and materials?

Feeling that the time is at hand when the Patent Office must enter upon either a period of very rapid decline or else upon a period of revitalization and expansion, shall we not test the notion that it may actually be easier, and in every respect better, for the office, exhibiting a new vision of its task, to ask a great deal more, rather than to continue its petition for the very, very little that has so often been denied it?

Relying upon the assistance of the composite committee generously formed by the National Research Council—

Can assistance be got, even now, in the making of a genuine advance in the indispensable work of reclassification of patents and of literature?

Can all who are employed in the work of examination be in any way further encouraged and aided to become specialists in one or another of the branches of applied science—rather than mere rule-parrots and picture-matchers? And would a proposed departmental organization of the office aid to this end?

Can these gains against dilatory prosecution made under the energetic efforts of Commissioner Ewing be rendered secure for the future by (*e. g.*), dating the terms of patent monopolies from the date of filing—in order to create an incentive for diligent rather than dilatory prosecution?

Could any adjustment of extra fees for extra claims discourage the "fog-artists" and create an incentive for a more genuine effort on the part of attorneys to find the meat of the coconut—instead of putting it up to the office, the courts or the public to do so?

Can any elevation of the standards of practise (effected perhaps with the assistance of the patent bar) relieve the office at the same time from an undue burden of editorial work and from any suspicion of complicity in the wholesale netting of "suckers" by men who indulge in misleading advertisements or contingent prosecution?

Can the divisions of the office advantageously be grouped into departments, each comprising several divisions handling analogous problems—a chemical department, an electrical department, an "instrument" department, a motive power department and the like, each under some expert of distinction in a particular field, and this body of experts having not only authority within their respective departments, but exercising collectively an enlightened and final appellate jurisdiction?

Can the salaries of these proposed department heads (constituting an enlarged and strengthened board) and the salaries of chiefs of divisions, and of others, be made such as to justify able and provident men in remaining for a much longer average term within this branch of the service?

Could the establishment in Washington of some great related institution, such as the proposed Institute for the History of Science, aid materially by an assembling, in this vicinity, of permanent exhibits genuinely illustrative of the advance of, *e. g.*, the chemical arts, the electrical arts, the motive power arts, the transport arts, etc., with a corresponding assembling and arrangement of pertinent literature from all the world, and with such an administrative organization as shall supplement the resources of this office, among others, sustaining its standards, while at the same time providing, in support of those who can maintain their scholarly interests and professional instincts, something of the stimulus and the opportunities of a true national university?

The mentioned special committee of the Patent Office Society takes this means of urging upon all interested the forwarding of any patent reform suggestions at once to Dr. Wm. F. Durand, National Research Council, Washington, D. C. It is not expected that patent reform can claim primary consideration during the continuance of the war, but it is felt that the time is ripe for at least a study of conditions and a renewed consideration of certain fundamentals from which it is felt that the office—charged "to promote the progress of science and the useful arts"—has departed through lack of information and support.

BERT RUSSELL, *Secretary*,
H. J. JEWETT, *Chairman*,
*Special Committee, Patent Office Section*

## SCIENTIFIC EVENTS

### FREE PUBLIC MEDICAL LECTURES

The faculty of medicine of Harvard University offers a course of free public lectures on medical subjects to be given at the medical school, Longwood Avenue, Boston, on Sunday afternoons at four o'clock, beginning January 6 and ending April 21, 1918.

January 6. Social hygiene and the war, Dr. Wm. F. Snow, major, Medical Reserve Corps, U. S. A.

January 13. Surgical shock, Dr. W. T. Porter.

January 20. Teeth and their relation to human ailments; a plea for conservation, Dr. G. H. Wright.

January 27. Home nursing, with demonstrations, Elizabeth Sullivan.

February 3. Child welfare during the war, Dr. Richard M. Smith.

February 10. Child welfare, Miss Mary Beard.

February 17. Shoes and structure of the foot, Dr. E. H. Bradford.

February 24. Social infection and the community, Bishop Lawrence.

March 3. The deformed mouth of a child; its effect on the child's future, Dr. L. W. Baker.

March 10. Food: how to save it, Dr. L. J. Henderson.

March 17. What to eat during the war, Dr. F. W. White.

March 24. Some aspects of fatigue, Dr. Percy G. Stiles.

March 31. Camp sanitation and control, and hospital administration at Camp Devens, Dr. Glenn I. Jones, major, Medical Corps, U. S. A.

April 7. Accident and injury, first aid (with simple demonstrations), Dr. J. Bapst Blake.

April 14. Immunity to contagious disease, Dr. E. H. Place.

April 21. Hay fever and asthma, Dr. I. Chandler Walker.

April 28. Food administration during the war, Dr. Julius Levy (under the National Food Committee).

### THE POPULAR MEDICAL LECTURES TO BE GIVEN AT THE STANFORD UNIVERSITY MEDICAL SCHOOL DURING JANUARY, FEBRUARY AND MARCH, 1918

The program is as follows:

January 4. The control of vice diseases among troops through civil and military cooperation, Colonel L. U. Maus, U. S. Army.

January 18. Surgery of the present war, Dr. Leo Eloesser.

February 1. Industrial fatigue, Professor E. G. Martin.

February 15. Food poisoning from canned goods, Dr. E. C. Dickson.

March 1. Recent experiences of a medical man in the war zone, Dr. William P. Lucas, professor of pediatrics, University of California.

March 15. Circulation of the blood, Dr. A. A. D'Ancona. Illustrated with moving pictures.

### WARTIME WORK OF THE FOREST SERVICE

How the work of the Forest Service was realigned to meet war conditions is described in the Annual Report of the Forester, which in the absence of the head of the service is made by Acting Forester A. F. Potter. The report also states that practically every form of use of the forests was greater than ever before, that the receipts again touched a new high level with a total of $3,457,028.41, and that the increase in receipts over the previous year was $633,487.70.

"When the grazing charge has been advanced to cover the full value of the grazing privilege," says the report, "the income from the national forests will be close to the cost of operation. The present annual cost is about $4,000,000." An increase equal to that of the last fiscal year "would close the gap."

The Forester, Henry S. Graves, is now serving with the American Expeditionary Forces in France, with a commission as lieutenant colonel, in connection with the forest work for the supply of the needs of our overseas troops and those of the Allies. A number of other members of the Forest Service received commissions in the Tenth Engineers (Forest) while many more entered the ranks.

Wood and other forest products have almost innumerable uses in modern warfare. Never before has the demand for exact knowledge been so urgent. "In the work relating to forest utilization and forest products, the resources of the service have been employed to the limit of their capacity since the war began in rendering assistance to the War and Navy Departments, the Emergency Fleet Corporation, various committees of the Coun-

cil of National Defense, and manufacturers of war orders. The peace-time program has been largely discontinued. The force and the work have been centered in Washington and Madison. Every effort has been made to bring available knowledge to the attention of the organizations which have need for it and to assist in anticipating their problems."

Much of the work has concerned aircraft material. It has included also problems connected with the construction of wooden ships and of vehicles. Assistance has been given to hardwood distillation plants in order to increase the production of acetone and other products needed for munition making. A commercial demonstration has shown that costs of producing ethyl alcohol from wood waste can be materially reduced. Methods have been developed by which walnut and birch can be kiln-dried in a much reduced time with comparatively little loss. In general, the report says, "much assistance has been given on a great variety of war problems relating to forest resources and the manufacture, purchase, and most efficient use of wood and other forest products."

In spite of the many new demands upon the Service and the entrance upon military duties of a considerable number of its men, the administrative and protective work on the national forests was continued without disorganization. "Upon request of the War Department the preliminaries of recruiting and officering the Tenth Engineers (Forest) were handled. Increase of crop production in and near the forests was stimulated and the forage resource of the forests was made available for emergency use up to the limit of safety. In the latter part of the summer a fire season of extreme danger, made worse in some localities by an unusual prevalence of incendiarism, was passed through with relatively small loss of property and with no reported loss of life."

## WAR ACTIVITIES OF THE GEOLOGICAL SURVEY

THE activities of the Geological Survey, Department of the Interior, during the fiscal year 1916–17 have been concentrated on investigations connected with military and industrial preparedness, as shown by the Annual Report of the director of the survey, just made public. These activities have included the preparation of special reports for the War and Navy Departments and the Council of National Defense, the making of military suveys, the printing of military maps and hydrographic charts, and the contribution of engineer officers to the Reserve Corps.

The survey's investigations of minerals that have assumed special interest because of the war have been both expanded and made more intensive. Special reports giving results already at hand, the product of years of field and office investigation, have been published for the information of the general public or prepared for the immediate use of some official commission, committee or bureau. Geologic field work has been concentrated on deposits of minerals that are essential to the successful prosecution of the war, especially those of which the domestic supply falls short of present demands. Every available oil geologist is at work in petroleum regions where geologic exploration may lead to increased production. Other geologists are engaged in a search for commercial deposits of the "war minerals"—manganese, pyrite, platinum, chromite, tungsten, antimony, potash and nitrate.

The war not only diverted practically all the activities of the topographic branch of the survey to work designed to meet the urgent needs of the war department for military surveys, but led to the commissioning of the majority of the topographers as reserve officers in the Corps of Engineers, United States Army.

A large contribution to the military service is made by the map-printing establishment of the survey. This plant has been available for both confidential and urgent work, and during the year has printed 96 editions of maps for the war department and 906 editions of charts for the navy department. Other lithographic work, some of it very complicated, was in progress at the end of the year.

During the year the survey published 203 scientific and economic reports, and at the end of the year the survey members holding ap-

pointments from the secretary numbered 934, an increase of 62.

## SCIENTIFIC NOTES AND NEWS

The American Association for the Advancement of Science begins its annual meeting at Pittsburgh on the day of issue of the present number of Science. The address of the retiring president, Dr. Charles R. Van Hise is given this evening, his subject being "Economic Effects of the World War in the United States." It is expected that the meeting of the association and of the national societies meeting at the same time will be smaller than usual, and that scientific problems of national concern at the present time will occupy most of the programs. Careful consideration was given to the desirability of holding the meeting. It was decided that the service it could render to science and the nation was far greater than any drawbacks. This was the opinion both of scientific men and of the officers of the government who were consulted.

Sir Archibald Geikie, who has long been a correspondent of the Paris Academy of Sciences, has now been elected an associate member of the academy.

Dr. William W. Keen, of Philadelphia, has declined the renomination of president of the American Philosophical Society, after serving ten years in that capacity.

Dr. Alexis Carrel, having been detained in America by official duties, the Harben lectures he was to have delivered in England at the end of this month have been postponed.

Gilbert N. Lewis, professor of physical chemistry and dean of the college of chemistry in the University of California, has been granted leave of absence for the half year beginning January 1, 1918, to serve as major in the Ordnance Department of the U. S. Army. He is to go at once to France.

Mr. Charles S. Wilson, state commissioner of agriculture of New York, has been reappointed to that office by the newly organized Council of Farms and Markets at Albany. His original appointment was made almost three years ago by the governor. Mr. Wilson was then professor of pomology in the State College of Agriculture at Cornell.

Dr. Frank C. Hammond has been appointed a member of the Philadelphia Board of Health to serve during the absence in France of Dr. Alexander C. Abbott.

A number of additional members of the University of California faculty have entered Army service, including Joel H. Hildebrand, associate professor of chemistry, now a captain in the Ordnance Department; Dr. A. L. Fisher, assistant in orthopedic surgery, now a captain in the U. S. Medical Reserve, attached to Base Hospital No. 30; and W. F. Hamilton, A. R. Kellogg, and J. B. Rogers, of the department of zoology, now in the Forestry Reserves.

F. G. Tucker, assistant professor of physics at the State College of Washington, has been granted leave of absence to take up his duties as second lieutenant in the U. S. Coast artillery.

The council of the Royal Meteorological Society has awarded Dr. H. R. Mill the Symons gold medal for 1918 "for distinguished work in connection with meteorological science."

The following letter has been received by the Duke of Connaught, President of the Royal Society of Arts from Mr. Orville Wright, of Dayton, Ohio.

> I have the pleasure of acknowledging the receipt of your Royal Highness's letter and the Albert Medal of the Royal Society of Arts, which were forwarded to me through the British Ambassador at Washington. I wish to express my appreciation of the honor conferred upon me by the Royal Society of Arts as a recognition of the work of my brother Wilbur and myself towards the solution of the problem of flight. I appreciate with the utmost gratification the honor of being placed by your society among such men as those to whom this coveted medal has been awarded in years past.

Professor Frederick Starr, of the department of sociology and anthropology at the University of Chicago, who has been in the Orient for the past year on leave of absence, will renew his work at the university with the winter quarter, giving courses in prehistoric

archeology and general anthropology. Professor Starr has been conducting special anthropological investigations in Korea and has published a book of some five hundred pages in Japanese. He has also published a paper on "Korean Coin Charms," which is issued by the Korean branch of the Royal Asiatic Society. Before leaving Japan Professor Starr gave two public addresses, one before the Tokyo Anthropological Society and one before the Asiatic Society of Japan.

PROFESSOR CHARLES BASKERVILLE, professor of chemistry and director of laboratories of the College of the City of New York, delivered a lecture at the Royal Canadian Institute, Toronto, Canada, on December 8, the subject being, The Hydrogenation of Vegetable Oils.

DR. E. O. HOVEY, of the American Museum of Natural History, delivered a public address on "Two years in the far North" at Syracuse University on December 7, under the auspices of the Sigma Xi Society.

PROFESSOR O. D. VON ENGELN, of Cornell University, addressed the Physiographers' Club of Columbia University on November 23 on "Types of Alaskan glaciers and features of the associated deposits."

SIR ARTHUR NEWSHOLME gave this year the Lady Priestley Memorial Lecture of the National Health Society. The subject was "The child and the home."

DR. LOUIS POPE GRATACAP, for the last twenty-seven years curator of mineralogy and a member of the staff of the American Museum of Natural History for forty-one years, died at New Brighton on December 19, aged sixty-seven years.

DR. CHARLES M. MANSFIELD, scientific assistant in the Biochemic Division of the U. S. Bureau of Animal Industry, died at his home in Washington, D. C., on December 17. Dr. Mansfield was an accomplished photographer and had contributed several articles to the photographic journals.

THE death is announced at the age of 43, of Dr. J. Rambousek, professor of factory hygiene, and chief state health officer, Prague.

LIEUT. CYRIL GREEN, known for his work in plant ecology and the physiological anatomy of water plants, was killed on the Palestine front early in November. He had been a member of the staff of the department of botany of the University College, London. Since the outbreak of the war he had been appointed head of the department of botany in the new Welsh National Museum at Cardiff, a position which was to have been held open for him until the conclusion of hostilities.

THE death is announced on November 4 of M. R. Nichéls, professor of geology in the University of Nancy.

THE Society of American Bacteriologists will hold its annual meeting in Washington, D. C., on December 27, 28 and 29. The morning and afternoon sessions will be held in the new National Museum. The president is Dr. Leo F. Rettger, New Haven, Conn.; the secretary, Dr. A. Parker Hitchens, Glenolden, Pa.

AT their recent annual meeting the board of trustees of the Carnegie Institution of Washington accepted from Mrs. E. H. Harriman the gift of the Eugenics Record Office at Cold Spring Harbor. This gift comprises about 80 acres of land, the office building with its records and other contents, the large residence and other buildings. In addition Mrs. Harriman has given to the trustees of the institution securities yielding an annual income of $12,000, as a fund for the office. The total valuation of the gift is about half a million dollars. The transfer has been made by Mrs. Harriman in order to ensure the permanent continuation of the work of the Eugenics Record Office. Except that the former board of scientific directors is dissolved the immediate management and personnel of the office have not been affected by the transfer.

THE regular monthly meeting of the California Academy of Sciences was held on December 19, when a lecture was given by Professor J. C. Bradley, Cornell University, on "The Okefinokee" (illustrated). Following the lecture Dr. Barton W. Evermann spoke

briefly concerning the establishment of Federal Fisheries Experiment Stations. The course of popular scientific lectures is being continued on Sunday afternoons at 3 o'clock in the auditorium of the Museum in Golden Gate Park. Announcements are made as follows:

December 16, The growth and transformation of insects (illustrated): Professor E. O. Essig, College of Agriculture, University of California.

December 23, The distribution of plants in California (illustrated): Professor Douglas Campbell, Department of Botany, Stanford University.

December 30, A fiesta of Indian summer: Professor C. L. Edwards, Director of Nature Study, Los Angeles Schools.

January 6, Midwinter birds of Golden Gate Park (illustrated): Professor Joseph Grinnell, Director of the Museum of Vertebrate Zoology, University of California.

January 13, Fish and game in California (illustrated by motion pictures): Dr. H. C. Bryant, Game Expert, California Fish and Game Commission.

The next meeting of the Botanical Society of Washington will be held at the Cosmos Club, Washington, D. C., January 3, 1918. Abstracts of the papers presented will be published in the *Journal* of the Washington Academy of Sciences. The program is as follows:

The botany and economics of the tribe Phaseoleæ, C. V. Piper.

Morphological characters and food value of soy-bean varieties, W. J. Morse.

Fermented soy-bean products, Dr. Chas. Thom.

The American species of the genus *Phaseolus*, Dr. D. N. Shoemaker.

The *Journal of the British Medical Association* reports that at a meeting of the Société Internationale de Chirurgie in Paris on November 3, 1917, which was attended by delegates from Belgium, France, Great Britain, Serbia, and the United States, it was resolved to dissolve the society after the publication of the volume of *Transactions* of the meeting held in New York on April 14, 1914. It was further resolved that, should there be any assets after the publication of this volume, the money shall be divided *pro rata* amongst the members, so that each member of the Germano-Austrian group shall receive his share, but that the shares belonging to members of other nations shall be retained and applied to some object of scientific reparation in Belgium. The meeting then determined that a new society shall be formed after the war on a basis similar to that of the Société Internationale de Chirurgie. It will be called the Société Interalliée de Chirurgie, but will be open also to such surgeons of neutral countries as may be nominated for election by the general committee.

A new journal of neurology and psychiatry in German, French and Italian has recently appeared under the direction of C. Von Monakow, professor of neurology in the University of Zurich, with the collaboration of all the well known Swiss neurologists and psychiatrists. The assistant editors in neurology are Dr. Bing (Basel), Dr. Minkowski (Zurich), and Dr. Naville (Geneva); in psychiatry, Professor Dr. Weber (Geneva) and Professor Dr. Maier (Zurich).

Dr. F. W. Clarke, chairman of the International Committee on Atomic Weights, writes in the *Journal* of the American Chemical Society that on account of the difficulties of correspondence between its members, due to the war, the International Committee on Atomic Weights has decided to make no full report for 1918. Although a good number of new determinations have been published during the past year, none of them seems to demand any immediate change in the table for 1917. That table, therefore, may stand as official during the year 1918.

The Science Club of the University of Oregon recently elected the following officers for the ensuing year: *President,* Dr. W. D. Smith, of the department of geology; *Secretary,* Dr. C. H. Edmondson, of the department of zoology. The following program has been arranged for the year:

November.—"Symposium on research," Professor O. F. Stafford, *chairman.*

December.—"Some research among northwest Indians," Mr. Frank Hall, curator, Washington State Museum, University of Washington.

January.—"The relation of physical to mental growth," Dr. B. W. DeBusk.

February.—"Thermo-electric properties of alloys," Dr. A. E. Caswell.

March.—"Investigations relating to the conservation and utilization of our fish resources," Professor H. B. Torrey, Reed College.

April.—"A rational map of Europe," Dr. Rebec.

May.—"Biologic investigations in southern California," Mr. Shelton.

THE chief signal officer requests that help be given to the Signal Corps of the army to obtain lenses enough for cameras for the fleet of observation airplanes now being built. The need is immediate and of great importance; the airplanes are the eyes of the army and the camera lenses are the pupils of those eyes. German lenses can no longer be bought in the open market. England met this difficulty in the earlier stages of the war by requiring lens owners to register lenses and requisitioning those needed. The Bureau of Standards of the United States Department of Commerce is now perfecting a substitute for the German "crown barium" glass used for lenses and will later be able to meet the needs, and special lenses are being designed for this work. The situation now, however, is that, with airplanes soon to be ready for service, suitable lenses can not be bought. Hundreds are needed at once. Possessors of the required types are urged to enlist their lenses in the army. They are asked immediately to notify the photographic division of the Signal Corps, United States Army, Mills Building Annex, Washington, D. C., of lenses of the following descriptions which they are willing to sell, stating price asked: Tessar anastigmat lenses, made by Carl Zeiss, Jena, of a working aperture of F. 3.5 or F. 4.5 from 8¼ to 20 inches focal length. Bausch & Lomb Zeiss tessars, F. 4.5, from 8¼ to 20 inches focal length. Voigtlander Heliar anastigmat lenses, F. 4.5, 8¼ to 20 inches focal length.

SECRETARY LANE, of the department of the interior, on August 16, formally authorized the establishment of a new mining experiment station under the jurisdiction of the school of mines at the University of Minnesota. Minnesota is one of two institutions to be so designated. The other bureau was established at Columbus, Ohio, the recognized center of the clay-working industries of the United States. In recommending the University of Minnesota to Secretary Lane for the site of one of the proposed stations, Director Manning, of the bureau, said that at the present rate of production the high grade ores of Minnesota will become almost exhausted the next thirty years and it will be the duty of the bureau to endeavor to show the way to utilize the huge deposits of low-grade ores if the industry is to continue to prosper. The station is to work in a cooperative way with the University of Minnesota, an agreement to that effect having been signed by both parties.

DURING the past summer, Professor C. H. Edmondson, of the department of zoology of the University of Oregon, has been conducting a survey of the shellfish resources of the northwest coast, under the direction of the U. S. Bureau of Fisheries. The survey is a part of the general conservation of food campaign undertaken by the federal government. In the course of the work the coast of Oregon has been traversed from about five miles south of Bandon to the mouth of the Columbia River and the Washington coast north to Gray's Harbor. All the important bays and inlets were visited and the species and relative abundance of the edible clams noted. The purpose of the survey, however, is not merely to determine the location of the edible shellfish, but to aid in all possible ways the increase of this type of food supply and to encourage the general public to make greater use of clams and mussels as a partial substitute for the higher priced meats. Few realize the abundance of food represented by the immense quantities of shellfish distributed along this coast or how cheaply edible clams may be obtained from the towns of Marshfield, Florence, Newport or Tillamook. In view of the fact that little is known of the life history of any of these shellfish of our coast, Professor

Edmondson has initiated experimental work at Florence, Newport and Tillamook for the purpose of determining the rapidity of growth, the age, the spawning season and the conditions under which certain of the edible clams best thrive. These experiments will be carried on throughout the year or until satisfactory results are obtained.

A QUESTIONNAIRE was recently circulated among the members of the Chartered Institute of Secretaries of Great Britain for the purpose of obtaining opinions in regard to the adoption of a decimal system of coinage in the United Kingdom, and the substitution of the metric system for the existing United Kingdom weights and measures. Of the replies received 85 per cent. considered that a change to a decimal system of coinage would be favorable to the business in which they were engaged, and 66 per cent. favored a £1 basis of coinage in preference to the "Imperial Crown" or dollar basis. In regard to weights and measures, 86 per cent. favored a change to the metric system, 53 per cent. of whom already used that system in their business. One member expressed the opinion that a strong commission of able men should be asked to decide whether the continental system, which was forced upon countries at a time when violence, rather than reason, prevailed, had been really satisfactory.

## UNIVERSITY AND EDUCATIONAL NEWS

IN honor to Andrew S. Hallidie, inventor of the use of the cable railway for passenger traffic in cities, who was a regent of the University of California from 1878 to 1900, the regents of the university have given the name "Hallidie Building" to a building which they are now erecting in San Francisco as an investment of University endowment funds.

W. J. SPILLMAN, chief of the office of farm management, U. S. Department of Agriculture, has accepted the deanship of the newly created college of agriculture at the State College of Washington. He will take up his new duties April 1, 1918, after he has completed a survey of the farm labor situation in the United States, upon which he is engaged as an emergency war measure.

A DEPARTMENT of plant pathology has been created by the regents of the State College of Washington, Dr. F. D. Heald, formerly professor of plant pathology, has been made head.

PROFESSOR F. L. WASHBURN of the University of Minnesota has been relieved of his present position in the Agricultural College and station and as state entomologist, and has been given the title of professor of economic vertebrate zoology, to take effect on February 5.

DR. A. L. TATUM, professor of pharmacology in the University of South Dakota, has been appointed assistant professor of pharmacology and physiology in the University of Chicago.

MR. ROY RICHARD DENSLOW, assistant tutor in the department of chemistry, College of the City of New York, has been appointed instructor in Smith College.

## DISCUSSION AND CORRESPONDENCE

### THE PITTSBURGH MEETING OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

[The following letter was delayed in the mails and reached SCIENCE just too late for publication in the last number.]

TO THE MEMBERS OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE:

WHEN the American Association for the Advancement of Science and all similar societies planned their winter meetings, the present situation could not have been foreseen. We had not even entered the war, and did not dream of a congestion of transportation such as now exists. When the present situation had developed, it was (in the opinion of a majority of the committee having power) too late to postpone our meeting.

Transportation is now so greatly overtaxed that necessaries of life can barely be carried; the railways should be spared every extra burden. Great simultaneous pilgrimages on important trunk lines are especially to be avoided, since they demand extra trains, need-

ing extra locomotives and coal, and causing much confusion. Therefore, in my opinion it behooves every patriotic and unselfish member to consider very seriously whether he can really serve his country by attending the meeting, or whether he can not better serve in this fateful time by staying at home, especially during a period of highly congested travel, when many of our soldiers may wish to take leave of their families before departing for the front. I believe that only those persons bringing really important contributions to the problems of the war should attend such meetings now. All others, in my opinion, should conserve their money for Liberty bonds and for those in distress, and should save their strength for action in this time of extraordinary crisis. For these reasons, with great regret, I have decided not to attend the meeting at Pittsburgh.

So far as I have been able to ascertain, all the responsible authorities at Washington concerned with transportation agree with me as to the importance of avoiding unnecessary journeys in such a crisis.

The very great usefulness of the American Association for the Advancement of Science is not dependent upon the unbroken continuity of its social meetings.

Science is incalculably important, indeed indispensable, in this world-wide cataclysm. The excellent work of the association in the past is now bearing fruit; but this moment demands action rather than general discussion. We must devote all our energies to winning the war. Let us all make every endeavor to apply our knowledge and strength in our country's noble cause.

THEODORE W. RICHARDS

CAMBRIDGE, MASS.,
December 15, 1917

## THE BEARING OF THE FACTS REVEALED BY ANTARCTIC RESEARCH UPON THE PROBLEMS OF THE ICE AGE[1]

RECENT Antarctic explorations and researches have yielded significant evidence regarding the problems of the Ice Age, and, of the similarity of the succession of geological climates in polar with those in other latitudes.[2]

These researches have been prosecuted to the ultimate limit of courage, devotion to duty and endurance—the noble sacrifice of life—as in the cases of Captain Scott, R.N., and his devoted companions and members of the expedition of Sir Ernest Shackleton.

The data secured by these expeditions are alone sufficient to establish the following premises:

1. That Antarctic ice, although covering areas several times larger than all other ice covered areas, is slowly decreasing in extent and depth.

2. That the same succession of geological climates have prevailed in Antarctic as in other latitudes.[3]

So vital are these evidences of the retreat of Antarctic ice that it may be well to briefly quote or refer to the most prominent instances:

> All these evidences and many others which space will not allow me to mention lead up to one great fact—namely, that the glaciation of the Antarctic regions is receding.[4]
>
> The ice is everywhere retreating.[5]
>
> The high level morains decrease in height above the present surface of the ice, the débris being two thousand feet up near the coast and only two hundred feet above near the plateau.
>
> (Scott's lecture on the great ice barrier.[6])

[1] This term as used by the writer refers to the Great Ice Age of Pleistocene Time. He holds that the occurrences of ice as a geologic agent of magnitude during eras preceding the Pleistocene were not "world wide" nor as "phenomenal," nor were they preceded, accompanied nor followed by conditions as significant as corresponding phenomena of the Ice Age. (Compte Rendû du XI ième Congrès Géologique International, p. 1105. Stockholm, 1910.)

[2] "Scott's Last Expedition," Vol. II., p. 206.

[3] This part of the evidence is not considered in this paper except inferentially as bearing upon the general subject.

[4] Scott, "The Voyage of the *Discovery*," Vol. II., page 416. See also pp. 423–24–25, and sketch map of ice distribution, p. 448.

[5] Scott, "National Antarctic Expedition, 1900–1904," Vol. I., p. 94.

[6] "Scott's Last Expedition," Vol. II., p. 294.

This observation applies to an ice-covered area of over 116,000 square miles.

Mr. Griffith Taylor notes the recession of Dry Valley Glacier twenty miles from the sea below Taylor Glacier.[7]

Mr. Taylor also notes and speaks with confidence of the passage of the Ice Age from Antarctica.[8]

In speaking of the evidence of ice retreat over Antarctic areas explored by him, Sir Ernest Shackleton said:

> Some time in the future these lands will be of use to humanity.[9]

This impressive and conclusive evidence is corroborated by the greater and still more impressive evidences of the comparatively recent uncovering of temperate land areas,[10] and the progressive retreat of the snow line to higher elevations in temperate and tropical latitudes and towards the poles at sea level, being far greater in Arctic than in Antarctic regions. We are therefore confronted with the conclusions:

1. That the disappearance of the Ice Age is an active present process and must be accounted for by activities and energies now at work, and that the use of assumptions and hypotheses is not permissible;

2. That the rates and lines of retreat are and have been determined by exposure to solar energy and the temperatures established thereby; and by the difference in the specific heat of the land and water hemispheres;

3. That the lines of the disappearance of ice are not conformable with those of its deposition, and mark a distinctly different exposure and climatic control from that which prevailed prior to the culmination of the Ice Age.

4. This retreat also marks a rise in mean surface temperature along these new lines, manifestly due to recently inaugurated exposure to solar radiation and also the inauguration of the trapping of heat derived from such exposure; which process is cumulative and has a maximum not yet reached.

The researches under the direction of Captain Scott and Sir Ernest Shackleton have therefore very rigidly conditioned any inquiry as to the causes of glacial accumulation and retreat. These conditions are CORRECTIVE and DIRECTIVE—*corrective,* in that they have entirely removed any doubts as to the alternate glaciation of the poles under the alternate occurrence of aphelion and perihelion polar winters by the precession of the equinoxes, as advanced by Croll; *directive,* in that they have imposed an appeal to energies now active as causes of retreat, and divested the problem of resorts to the fascinating but dangerous uses of suppositions and hypotheses.

They have, moreover, pointed out with unerring accuracy the vital conclusion that the same energies which have but recently converted the glacial lake beds of Canada into the most productive grain fields of the world will in time convert the tundras of to-day into the grain fields of to-morrow.[11]

The bearing of this conclusion upon the ultimate development of the human race is so far-reaching in its consequences that the great sacrifice of life attendant upon the prosecution of these researches stands forever as a memorial in the correction of the erroneous and wide spread conception that the earth is in a period of refrigeration, desiccation and decay; and establishes the conclusion that it is in the spring time of a new climatic control during which the areas fitted for man's uses are being extended and that the moss of polar wastes will be replaced by rye and wheat.

MARSDEN MANSON
SAN FRANCISCO, CALIFORNIA

[7] *Ib.*, p. 286.

[8] *Ib.*, p. 288. See also photograph following p. 286 and p. 292.

[9] Address to the Commonwealth Club, San Francisco, Calif., November 7, 1916.

[10] Slight fluctuations in the retreat of the small residual glaciers in temperate latitudes are noted in the reports of the Commission on Glaciers of the International Geological Congress by Professor Harry Fielding Reid. But the great measures of the progressiveness of glacial retreat are in the past disappearance of the Pleistocene ice fields of temperate latitudes and the present retreat in the Antarctic and Arctic regions.

[11] See also Compte Rendû du XIième Congrès Géologique International, p. 1102. Stockholm, 1910.

## EFFICIENT LABORATORY LIGHTING

SEVERAL notes have appeared in SCIENCE the past few years relative to the development of glass through which a proper spectroscopic correction could be secured for microscopic purposes. There are also on the market various microscope lamps designed to furnish a corrected artificial light for laboratory study.

These devices, though very satisfactory for small advanced classes, are in many ways undesirable for large classes of elementary students, and sitting, as they usually do, on the laboratory table, are more or less subject to breakage when used by large numbers of students.

The dark winter days during a part of the school year made it imperative that the large classes in agricultural botany at Oregon Agricultural College be provided with a light which would yield relative daylight values with temporary mounts and stained prepared sections. This has been attained most efficiently by the use of the General Electric Company's Ivanhoe Truetint Unit No. 748, known as the "Noon Sunlight" grade. This is a large, apparently blue shade, designed to cover the high-power nitrogen-filled Mazda lamp. Experience has shown that one of these units suspended two feet above the laboratory table and equipped with a one-hundred-watt bulb gives a superior light for four students. In this way, forty students at one time are being handled with ease on dark days, the illumination being ample even for the high-power dry or the oil immersion objectives.

The cost of the entire installation is approximately the same for four men as that of the usual microscope lamp designed for one person. To secure a fixture which would be near the table without obstructing it for laboratory work, the shade holders were suspended by nickel chains from the ceiling over the center of each table. The lack of rigidity of the fixture thus equipped is of special advantage in the elimination of breakage.

W. M. ATWOOD
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## SCIENTIFIC BOOKS

*The Elements of the Science of Nutrition.* Third Edition. By GRAHAM LUSK. Philadelphia, W. B. Saunders Co., 1917. Pp. 641.

It is sometimes said that the sciences and the fine arts are international in the broadest sense of the word; they do not recognize national boundaries or racial limitations. Nevertheless a nation may well be concerned about the accomplishments of its citizens in the pursuit of knowledge. "Knowledge once won," Gowland Hopkins has recently written in a commendable essay on medicine and experimental science, "is of no country; it is the common guerdon of mankind; but he who cares nothing as to where it grows seems to lack an element of patriotism."

From this standpoint American science need not be dissatisfied with the contributions which the workers in this country have made to the study of nutrition in the past decade. Lusk's "Science of Nutrition," which has established itself as a stimulating and comprehensive text-book, discloses the names of more than one hundred American investigators whose labors have helped, probably in larger measure than those of any other country, to bring new facts and permit new viewpoints in nutrition during the interval that has elapsed since the earlier (1909) edition of the book. Its size has been expanded from 400 to 600 pages not by the mere accretion of incidental observations but by the addition of carefully considered novelties which the later development seems to warrant as worthy of consideration.

The style and mode of treatment of the problems of nutrition remain essentially unchanged in the new edition. The historical method has been followed in a way that can not fail to interest those who are more familiar with the subject-matter, and that ought to enthuse the beginner. There is something almost inspiring in following the story from its beginnings in the days of Lavoisier down to the ingenious contrivances for respiration study and calorimetry so highly developed in the university laboratories and research in-

stitutes of the United States. A special new chapter is devoted to some of this modern technique that has furnished such helpful measurements of the basal metabolism of man and the domestic animals.

The novelties must be sought on every page; for the new edition is not an expedient of bookmaking but a record of progress. Among the major accessions are elaborate discussions of the possible processes of intermediary metabolism. To those who learned their physiology with a former generation the newer chemical language may seem almost incomprehensible. But Lusk properly remarks (p. 175): "One must know the life history of sixteen amino-acids in order to be familiar with the metabolism of protein. Though the extension of knowledge may have been at the cost of simplicity, yet order is being wrought out of apparent complexity. It is often difficult for an older generation to think in terms of the knowledge of a new. The author's father was a student at Heidelberg at the time when the modern chemical formulæ were introduced, when H—O became $H_2O$, and he recalled the distracted exclamation of one of the university professors, 'Ach Gott! wie kann man so lernen!'"

A new chapter on The Nutritive Value of Various Materials used as Foods develops the history of the latest standpoints which are threatening to upset so many of the currently taught doctrines. "It is evident from the material presented in this chapter," Lusk writes (p. 378), "that the science of nutrition includes something more than the production of energy from fat, carbohydrate and protein. There must be certain salts and certain qualities of protein in the diet, and there must be minute amounts of 'vitamins.' The chemical composition of the latter will some day be known, even as the chemical composition of epinephrin is known. Epinephrin, an essential of life, is present in the blood to the extent of 1 part in 100,000,000. In like manner, vitamins which are present in meat, milk, fresh green vegetables and grains are essential to the harmonious correlation of the nutritive functions of animals.

Nephritis, cardiac disease and other conditions involving acidosis are also considered in their relation to metabolism. A highly interesting and exceptionally timely chapter on Food Economics concludes the volumes. A few brief excerpts will suffice to indicate some of the attitudes of the author. After urging the sale of food by calories and not by pounds Lusk adds (p. 569): "The main objection that has been encountered to the sale of food on the caloric basis has been the sensitiveness of the business world to the introduction of a new and unknown quantity. Why not leave well enough alone? A more highly educated generation will, however, demand that its expenditure of thousands of millions of dollars for food shall not continue to take place in unfathomable depths of darkness." Again (p. 571): "The housewife should know about cooking, and both she and her husband should know something of the value of food. The sum wasted for alcoholic beverages would frequently be sufficient to turn the scale in favor of the proper nutrition of the family. Cheaper milk for the babies of the poor and adequate nourishment for school children are important factors in the situation. . . . As this book goes to press it seems that America herself is certain to face a food shortage before very long. This can be remedied by increasing the number of milch cows and by reducing the livestock raised for meat. The latter would free arable land for the production of grain and potatoes and save, for human consumption, grain fed to steers. It is quite certain that meat in the quantity it is consumed to-day is entirely unnecessary, and it is susceptible of scientific proof that mechanical work is more efficiently and economically derived from carbohydrate food than from meat."

When the author expresses his conviction that "in another decade the development of scientific knowledge will probably permit the formulation of the subject from the standpoint of physical chemistry" the reviewer is less sanguine regarding the complete dominance of a single mode of attacking the problems of nutrition. Against the author's published statement that he has no intention of

again revising his book, protests are already being heard even from across the Atlantic. Success entails responsibilities.

LAFAYETTE B. MENDEL

SHEFFIELD SCIENTIFIC SCHOOL,
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NEW HAVEN, CONN.

*Occasional Papers of the Museum of Zoology, University of Michigan.* Nos. 1–35, 1913–17 (each separately paged). Ann Arbor, published by the University.

Dr. A. G. Ruthven, the Director of the Museum of Zoology of the University of Michigan, is heartily to be congratulated upon the appearance of the first volumes of these "Occasional Papers." Nowadays when every one is continually receiving requests to subscribe to some new journal or other, this series comes as a refreshing delight; it is not published for sale! We learn that the papers are issued separately to libraries and specialists, and, when sufficient matter has accumulated, a title page and an index—an excellent index by the way—is prepared and the volume is sent forth.

The contents will appeal especially to the modernized systematist, who tries, at any rate, to take interest in ecology, zoography and the careful noting of life histories. We find notices not only of such astonishing novelties as *Lathrogecko, Pseudogonatodes* and *Calliscincopus* among reptiles, and of *Cryptobrachus* and *Geobatrachus* among amphibia, but of more general interest are the very interesting observations upon the egg-laying and hatching of several South American species of amphibia, of varied genera, in all of which some significant and peculiar adaptation or modification is recorded. The series is not, however, for the herpetologist alone. Reighard and Cummins have a model description of a new *Ichthyomyzon* with notes and figures of its appearance and customs. Other writers discuss crustacea, insects of various groups, trematodes, as well as birds and mammals.

That these articles were not chosen for the collection but simply represent the natural output for this comparatively new and hitherto little-known museum indeed augurs happily for the future of the series and for that of the museum as well. Workers in the Museum of Comparative Zoology at Harvard are perhaps naturally more *sympatico* than others and when they review their own museum's past it is not difficult for them to foresee the swift growth of another great university museum of similarly unrestricted interest and endeavor at Ann Arbor.

T. BARBOUR

## SPECIAL ARTICLES

### CONCERNING THE INFLUENCE OF THE AGE OF AN ORGANISM IN MAINTAINING ITS ACID-BASE EQUILIBRIUM

THE importance of the maintenance on the part of the blood and tissue juices of a hydrogen ion concentration within certain narrow limits of variation has been established through the work of J. S. Haldane and L. J. Henderson. Recent investigations have not only served to emphasize the importance that the organism should maintain a certain acid-base equilibrium for its physiological life, but have also shown that when the mechanism which regulates this equilibrium is interfered with so that the hydrogen ion concentration of the blood is increased and maintained for an adequate time, the organism no longer functionates normally, but becomes pathological in certain of its reactions.

It is not the object of this note to enter into a discussion of the factors concerned in maintaining a normal acid-base equilibrium, nor to discuss those pathological conditions in which a variation from the normal is frequently observed. The object is to call attention to the influence of the age of the organism in controlling the mechanism by which the acid-base equilibrium is kept within the bounds of normality.

Some years ago, while conducting a series of experiments in which uranium nitrate was employed as the toxic agent to induce an acute nephritis, the observation was made that this substance was more toxic for old animals than for young animals.[1] This variation in

[1] MacNider, W. deB., "On the Difference in the

degree of toxicity was expressed by the older animals becoming both albuminuric and glycosuric at an earlier period following the use of uranium than was the case with the young animals. Furthermore, the quantitative output in the urine of both albumin and glucose was greater in the old animals than in the young animals. When the kidneys of these animals were studied histologically there was found to exist more evidence of kidney injury in the organs from old animals than in those from young animals. In so far as the kidney was concerned in the reaction, uranium was more toxic in an old animal than in a young animal.

In a later series of experiments[2] in which the age of the animals was taken into account, animals following an intoxication by uranium gave evidence of developing an acid intoxication much earlier than did the younger animals. The experiments also demonstrated that the acid intoxication in the older animals was of a severer degree than in the young animals. The evidence for the development of an acid intoxication in these animals of different ages consisted in noting the time of appearance and quantitative output in the urine of acetone bodies, and in determining the relative degree of tolerance for an alkali by the two groups of animals. The old animals showed an earlier appearance in the urine of acetone bodies, a greater quantitative output of these bodies, and a greater tolerance for an alkali than did the younger animals.

In these experiments it was furthermore shown, that by the intravenous use of an alkali in a young animal the kidney could be successfully protected against the toxic effect of an anesthetic while in the older animals the difficulty of furnishing this protection increased with the age of the animal.

In a recent study[3] of the relative toxicity of uranium nitrate in animals of different ages, the observation has been made that the old animals not only show a severer grade of acid intoxication as indicated by the appearance of acetone bodies in the urine than do the younger animals, but these old animals also show a more marked increase in the hydrogen ion concentration of the blood, which is associated with a more rapid depletion of the alkali reserve of the blood and a greater reduction in the tension of alveolar air carbon dioxide. Associated with this change in the acid-base equilibrium of the blood there develops a kidney injury which is histologically more marked in the old animals than in the young animals.

In a final series of experiments[4] it has been found possible to maintain in some measure the functional capacity of the kidney and the response of this organ to various diuretic substances by employing a solution of sodium carbonate to restore the alkali reserve of the blood and maintain an acid-base equilibrium of the blood which approaches in degree the reaction of normality. The ease with which the acid-base equilibrium of the blood can be restored and maintained in an animal intoxicated by uranium, and the degree of protection which is furnished the kidney is dependent upon the animal's age. The acid-base equilibrium is more easily restored and can be maintained for a longer time in a young animal than in an old animal. The protection of the animal against the toxic effect of uranium is more perfect in a young animal than in an old animal.

From the experiments which have been cited it would appear that there is a definite association between the toxic effect of uranium and its ability to induce an acid intoxication

Response of Animals of Different Ages to a Constant Quantity of Uranium Nitrate," *Proc. Soc. Exp. Biol. and Med.*, Vol. XI., 159, 1914.

[2] MacNider, W. deB., "The Inhibition of the Toxicity of Uranium Nitrate by Sodium Carbonate, and the Protection of the Kidney Acutely Nephropathic from Uranium from the Toxic Action of an Anesthetic by Sodium Carbonate," *Jour. Exp. Med.*, Vol. XXIII., 171, 1916.

[3] MacNider, W. deB., "A Consideration of the Relative Toxicity of Uranium Nitrate for Animals of Different Ages," I., *Jour. Exp. Med.*, Vol. XXIV., p. 1, 1917.

[4] MacNider, W. deB., "The Efficiency of Various Diuretics in the Acutely Nephropathic Kidney, Protected and Unprotected by Sodium Carbonate," *Jour. Exp. Med.*, Vol. XXIV., 19, 1917.

and that the age of the animal very largely determines the rapidity of development and the severity of this intoxication.

When animals of different ages are intoxicated by this metal the factor of the age of the organism in the reaction is expressed by an inability of the senile animal to maintain with the same degree of perfection a normal acid-base equilibrium as is the case with the younger animal.

WM. DEB. MACNIDER
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## BOSTON MEETING OF THE AMERICAN CHEMICAL SOCIETY. V

*On the mechanism of the potassium chlorate-manganese dioxide reaction:* RAYMOND F. BACON and R. W. MILLER. As the result of their experimental investigation of the mechanism of the so-called potassium chlorate-manganese dioxide reaction, the authors conclude that: (1) Avoiding local heating, potassium chlorate and manganese dioxide begin to react at 255° C. The most vigorous reaction occurs at 310° C. (2) The potassium chlorate oxidizes the manganese dioxide at the lower temperature to form a higher unstable oxide, which is decomposed later into manganese dioxide. It is impossible to isolate this intermediate oxide on account of the great velocity of the reaction. (3) This initial oxidation generates heat, and this, coupled with the heat applied, causes the reaction to go, with a very rapid rise in temperature. This high temperature causes certain secondary reactions to occur. (4) The first of these secondary reactions between the potassium chlorate and manganese dioxide results in the formation of manganous chlorate, which decomposes into manganous chloride, chlorine and oxygen. The manganous chloride is partially oxidized to manganese dioxide and chlorine. Potassium oxide reacts with manganese dioxide, in the presence of oxygen, to form potassium manganate, which is changed by some of the chlorine to potassium permanganate. The excess of chlorine escapes. Of the potassium chlorate used, only 0.503 per cent. enters into these changes. (5) An average of 5.428 per cent. of manganese dioxide is used up in this reaction. Almost all of this loss is accounted for from the soluble manganese compounds produced in the secondary reactions. (6) The manganese dioxide serves as an interacting catalyst in this reaction, hastening the speed of the change by actually reacting with the potassium chlorate, to form an intermediate oxide, which sets free the manganese dioxide again before the conclusion of the reaction.

*The measurement of the compressibilities of solids under hydrostatic pressure up to 12,000 megabars:* LEASON H. ADAMS and ERSKINE D. WILLIAMSON. The compressibilities of the following metals under hydrostatic pressures from two to twelve megabars have been measured by a comparative method—silver, bismuth, copper, zinc, brass, tin, cadmium, lead, gold, aluminium, tin-bismuth alloy. The results are accurate to about 1 per cent. of their values. In the case of the more compressible metals an estimation of the falling off of the compressibilities at higher pressures is obtained.

*Compounds formed by the alkali oxides $K_2O$ and $Na_2O$ with the trioxides of aluminum and iron:* GEORGE W. MOREY. A description of the preparation and properties of some alkali aluminates and ferrites.

*Sulfuric acid as an acidimetric standard:* MARSTON LOVELL HAMLIN and CHARLES BLAKE CLOUD. The preparation and use of 100 per cent. $H_2SO_4$ for a primary acid: nitric standard is described, previous work is cited, comparison of results with standardizations by other methods is given.

*The production of ozone in the corona:* F. O. ANDEREGG. One of the methods for the fixation of nitrogen is its "burning" in the electric arc, the combination being due chiefly to the ions. The laws that govern the important relationships between ionization and chemical action are still obscure. To simplify the problem the study with a single gas has been begun with the formation of ozone in the corona which is probably the simplest form of electrical discharge occurring at atmospheric pressure. Opposed to the ozonizing effect there is a deozonizing effect with a resulting equilibrium.

*Some properties of the oxides of lead:* L. H. ADAMS and H. E. MERWIN. The oxides PbO and $Pb_3O_4$ were prepared in well crystallized form and their densities and optical properties determined. The monoxide exists in two polymorphic modifications having an enantiotropic inversion point at about 570°. Some interesting effects of pressure on crystals of the yellow form of PbO are described.

*A new illuminator for microscopes:* ALEXANDER SILVERMAN. The illuminator consists of a small circular tube lamp surrounding the objective, and

operated by a six-volt storage cell. It may be lowered into a hollow object, the lamp being attached to the microscope tube and moving with it. Especially convenient for the study of enamels, alloys, opaque objects and substances contained in opaque vessels. A model will be exhibited in operation.

*The qualitative separation and detection of gallium:* Philip E. Browning and Lyman E. Porter. A study of the occurrence of the element shows it to be most closely associated with Pb, Al, Fe, Mn, Zn and In. Analytically it falls into the Al group, its hydroxide being precipitated by $NH_4OH$ in the presence of $NH_4Cl$ and being soluble in an excess of NaOH. The chief analytical problem is its separation from Al and two methods are studied, both of which give satisfactory results. First, the method of de Bois Vaudran, precipitating $Ge_3(FeC_6N_6)_4$ by $K_4FeC_6N_6$ in the presence of strong HCl to about one third the volume of the liquid. Second, saturating a solution with HClga in the presence of ether, which throws out the $AlCl_3$ and keeps the Ga in solution.

*The qualitative detection of germanium and its separation from arsenic:* Philip E. Browning and Sewell E. Scott. A study of the occurrence of the element shows it to be most closely associated with Ag, Pb, Hg, Cd, As, Sn, Zn, Ti and Cb. It falls in the analytical group with As and Sn since its sulphide is soluble in $(NH_4)_2S$. It is separated from Sn by treating the sulphides with $(NH_4)_2CO_3$, $GeS_2$ being soluble. From As it may be separated by treating a solution of the sulpho salts with ammonium acetate, acidifying with acetic acid and passing $H_2S$. $As_2S_3$ is precipitated and Ge remains in solution. The following modification of Buchanan's method was devised for the separation and detection of Ge. The germanium material was dissolved in strong hydrochloric acid (5–10 cm.³) in a test tube some $KMnO_4$ added, to keep arsenic if present in the higher condition of oxidation and distilled into another test tube kept cool in water. After distilling about one half volume the Ge is found in the distillate by means of $H_2S$.

*Silver anion:* H. C. P. Weber. It is customary to think of silver as a strictly monovalent element, which forms in solution a positive ion. When a solution of a silver salt is electrolyzed at high current density a black deposit is formed at the anode which has been variously described as silver peroxide and as silver peroxynitrate, the formulas ascribed varying but tending to indicate the presence of trivalent silver. It is now shown that in this compound we have silver which in transference experiments acts as an anion, probably trivalent, a very unstable and intensely active oxidizing agent. It is not derived from hydrogen peroxide but rather of the permanganate type. The compound is of great interest in connection with the valence of silver in particular, and valence in general.

*The fixation of nitrogen with the silent electric discharge:* Farrington Daniels and Oliver R. Wulf. The oxidation of nitrogen by the silent or cold electric discharge has been proved. No energy is lost as heat, and under the proper conditions nitrogen pentoxide instead of nitrogen peroxide is formed. This should simplify the absorption towers. Pressure favors this reaction but not the reaction which gives nitric oxide. Practical applications have failed because the reaction is too slow. A search for a catalyzer was unsuccessful. Experiments with various types of discharge chambers look hopeful.

*The displacement of nitric by carbonic acid in silver nitrate solutions and the relation of this reaction to the inclusion error in the silver voltameter:* A. S. McDaniel and H. D. Hineline. It has been shown that carbon dioxide reacts slowly with silver nitrate in aqueous solution forming a carbonate of silver and liberating free nitric acid. Crystals of the carbonate have been isolated and identified. The nitric acid liberated has been estimated by titration with iod-eosin and its amount compared with the silver contained in the crystals of silver carbonate. The reaction is believed to be as follows:

$$Ag\,NO_3 + H_2CO_3 \rightleftarrows Ag\,HCO_3 + HNO_3.$$

About one one-hundredth of one per cent. of the silver nitrate is converted to the carbonate. In the silver voltameter a clear solution of silver nitrate which has been saturated with $CO_2$ gives a deposit about 0.4 per cent. too heavy. This effect was first shown by Rosa Vinal and McDaniel, but it was thought by them that the amount of $CO_2$ normally present in air has no appreciable effect upon the mass of deposit. In the present investigation a few direct measurements have been made of the effects produced by one to ten times the normal amounts of $CO_2$ present in the air and while the results are incomplete they indicate that the effect of the normal amount of $CO_2$ in the air is not negligible and indeed may be larger than the inclusion error in normal deposits.

(*To be continued*)

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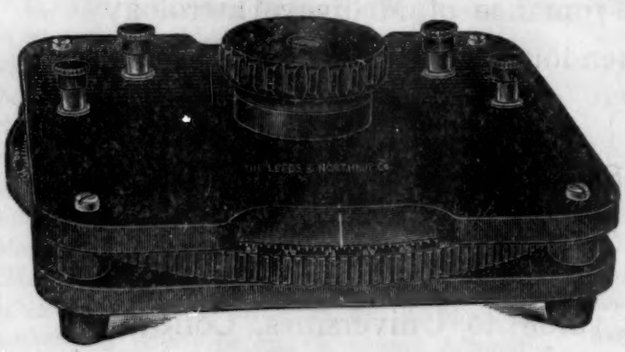

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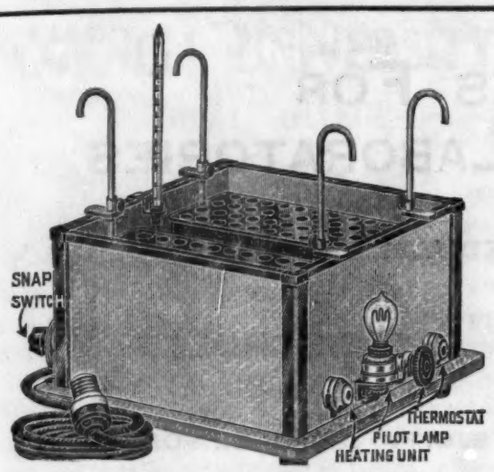


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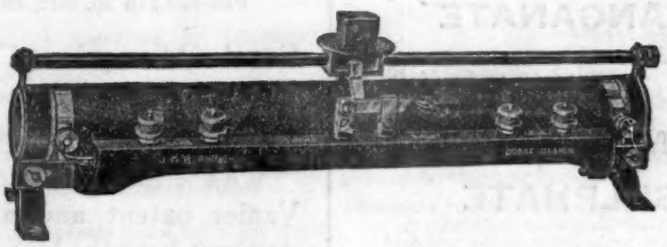

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Holders of a Baccalaureate degree or Seniors who can present a degree before entering the Second Year, who also present the requisite courses in Chemistry, Physics, and Biology, are admitted from recognized Colleges or Scientific Schools. The Session opens on the last Wednesday in September. The first year is devoted to Anatomy, Chemistry, and Physiology and may be taken either in Ithaca or New York City. The last three years are chiefly Clinical and must be taken in New York City.

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For further information and catalogue address

**THE DEAN, CORNELL UNIVERSITY**

**MEDICAL COLLEGE**

**(Department B.)**

**First Ave. & 28th St. New York City**

# Washington University

## Medical School

### REQUIREMENTS FOR ADMISSION

Candidates for entrance are required to have completed at least two full years of college work which must include English, German, and instruction with laboratory work in Physics, Chemistry and Biology.

### INSTRUCTION

Instruction begins on the last Thursday in September and ends on the second Thursday in June. Clinical instruction is given in the Barnes Hospital and the St. Louis Children's Hospital, affiliated with the medical school, the St. Louis Mullanphy Hospital, the St. Louis City Hospital, and in the dispensaries connected with these institutions.

### COURSES LEADING TO ACADEMIC DEGREES

Students who have taken their premedical work in Washington University, are eligible for the degree of B.S. upon the completion of the first two years of medical work.

Students in Washington University may pursue study in the fundamental medical sciences leading to the degree of A.M. and Ph.D.

### TUITION

The tuition fee for undergraduate medical students is $150 per annum.

The catalogue of the Medical School and other information may be obtained by application to the Dean.

**Euclid Avenue and Kingshighway St. Louis**

# Syracuse University College of Medicine

**Entrance Requirements** Two years of a recognized course in arts or in science in a registered college or School of Science, which must include German, Physics, Chemistry, and Biology. Six and seven years' combination courses are offered.

**The First Two Years** are spent in mastering by laboratory methods the sciences fundamental to clinical medicine.

**The Third Year Course** is systematic and clinical and is devoted to the study of the natural history of disease, to diagnosis and to therapeutics. In this year the systematic courses in Medicine, Surgery and Obstetrics are completed.

**The Fourth Year Course** is clinical. Students spend the entire forenoon throughout the year as clinical clerks in hospitals under careful supervision. The clinical clerk takes the history, makes the physical examination and the laboratory examinations, arrives at a diagnosis which he must defend, outlines the treatment under his instructor and observes and records the result. In case of operation or of autopsy he follows the specimen and identifies its pathological nature. Two general hospitals, one of which is owned and controlled by the University, one special hospital and the municipal hospitals and laboratories are open to our students. The afternoons are spent in the College Dispensary and in clinical work in medical and surgical specialties and in conferences.

**Summer School**—A summer course in pathology covering a period of six weeks during June and July will be given in case there is a sufficient number of applicants.

**Address the Secretary of the College,**

**307 Orange Street SYRACUSE, N. Y.**

# Tulane University of Louisiana

## COLLEGE OF MEDICINE

**(Established in 1834)**

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**School of Medicine—**

**After January 1, 1918, all students entering the Freshman Class will be required to present credits for two years of college work, which must include Biology, Chemistry and Physics, with their laboratories, and one year in German or French.**

**Graduate School of Medicine—**

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**School of Pharmacy—**

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**School of Dentistry—**

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## 1765 School of Medicine of the University of Pennsylvania 1918

**The One Hundred Fifty-third Annual Session of this institution will open September 27, 1918, and continue until June 19, 1919.**

The First and Second Year Classes are ordinarily limited to 100 students; during the period of the war this limitation will not be strictly enforced. Application for admission should be in the hands of the Dean before July 1st.

**REQUIREMENTS FOR ADMISSION:** Candidates must have successfully completed the work prescribed for the Freshman and Sophomore Classes in colleges recognized by this University, which must include at least one year of college work in Physics, General Biology or Zoology and Chemistry (Qualitative Analysis is required; Organic Chemistry is recommended, and in 1919 will be required), together with appropriate laboratory exercises in each of these subjects, and either French or German of more than elementary grade. For detailed information send for catalogue.

**UNDERGRADUATE COURSE:** The course of instruction extends over four annual sessions, the work so graded that the first and second years are largely occupied by the fundamental medical subjects. The third and fourth years are largely devoted to the practical branches, prominence being given to clinical instruction, and the classes sub-divided into small groups so that the individual students are brought into particularly close and personal relations with the instructors and with the patients at the bedside and in the operating room. After graduation further hospital work is undertaken by the members of the class; and more than 90 per cent. attain by competitive examination or by appointment positions as internes in hospitals in this city or elsewhere. The Pennsylvania Bureau of Medical Education and Licensure requires of applicants for license a year spent in an approved hospital.

**POST GRADUATE WORK:** (1) Any graduate possessing a baccalaureate degree may pursue work in Anatomy, Physiology, Physiological-Chemistry, Bacteriology, Pathology, Pharmacology, Research Medicine and Mental Diseases with view of obtaining the higher degrees of Master of Arts or Science and of Doctor of Philosophy in the Graduate School of the University. For information address Dean of Graduate School, University of Pennsylvania.

(2) Courses in Public Hygiene (inaugurated in 1906) leading to diploma (Doctor of Public Hygiene, Dr. P.H.), are open to graduates in medicine who have had a preliminary education similar to that required for admission to the Medical School. The subjects comprehended in the course are: Bacteriology, Medical Protozoology and Entomology, Chemistry, Sanitary Engineering, Sanitary Architecture, Meat and Milk Inspection, School Inspection, Vital Statistics, Sanitary Legislation, and Personal and General Hygiene.

The full course extends over one academic year. Special subjects in the course may be taken by any one possessing suitable preliminary qualifications. For details address Director of Laboratory of Hygiene.

(3) From the opening of each term to about February 1 courses in Tropical Medicine are open to graduates in Medicine, comprehending instruction in Medical Climatology and Geography, Hygiene of Tropics and of Ships, Tropical Medicine, Bacteriology, Protozoology, Entomology, Helminthology, and General Medical Zoology, Pathology, Skin Diseases, Eye Diseases, and Surgery of Tropical Affections.

(4) During the academic session special courses in any of the branches of the medical curriculum are open to graduates of this or other regular schools of Medicine, both in the clinical subjects and in laboratory studies. The excellent hospital facilities offered by the University Hospital, the neighboring Philadelphia General Hospital and other institutions with which the members of the staff of instruction are connected, guarantee exceptional opportunities for clinical observation.

**TUITION FEE:** Undergraduate study, $200 annually; fees for special courses on application. For detailed information or catalogue address

**DEAN OF SCHOOL OF MEDICINE**

**University of Pennsylvania** **Philadelphia, Pa.**

# University of Alabama

## School of Medicine

**Mobile, Alabama**

### Entrance Requirements

The satisfactory completion of two years of study, in an institution of collegiate grade, to include Biology, Chemistry, Physics, and a reading knowledge of French or German. In addition to four year High School diploma.

### Combined Course

The Combined Course which is now offered by the University in connection with its Medical Department gives to the student the opportunity of obtaining the B.S. and M.D. degrees in six years. This course is recommended to all intending students.

The equipment of the school is complete. The clinical facilities ample. Eight full time teachers.

For catalog and any desired information, address

**Tucker H. Frazer, M.D., Dean**
**School of Medicine**
**St. Anthony and Lawrence Sts.,**
**MOBILE, ALA.**

# University of Georgia

**MEDICAL DEPARTMENT**
**Augusta, Georgia**

**The eighty-sixth session begins September 12, 1917; closes May 29, 1918**

### ENTRANCE REQUIREMENTS

Candidates for entrance this session must have completed one full year of work in an approved college in addition to four years of high school. The college work must have included Physics, Chemistry, Biology and French or German. Beginning in 1918 two years of college work will be required.

### INSTRUCTION

The course of instruction occupies four years. The first two years are devoted to the fundamental sciences, and the third and fourth to practical clinic instruction in medicine and surgery. All the organized medical and surgical charities of the city of Augusta and Richmond County, including the hospitals, are under the entire control of the Board of Trustees of the University. This arrangement affords a large number and variety of patients which are used in the clinical teaching. Especial emphasis is laid upon practical work both in the laboratory and clinical departments.

### TUITION

The charge for tuition is $150.00 a year except for residents of the State of Georgia, to whom tuition is free.

For further information and catalogue address,

**The Medical Department, University of Georgia**
**AUGUSTA, GEORGIA**

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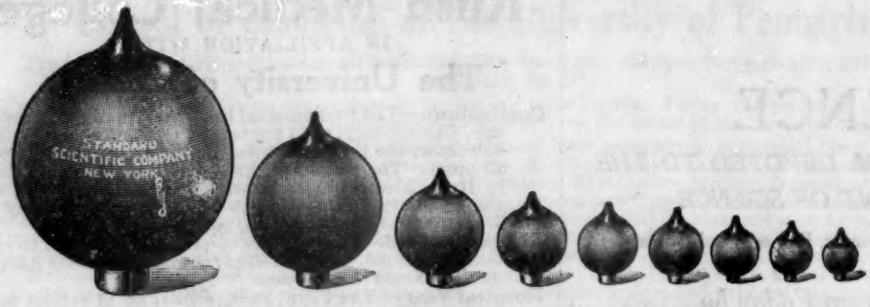


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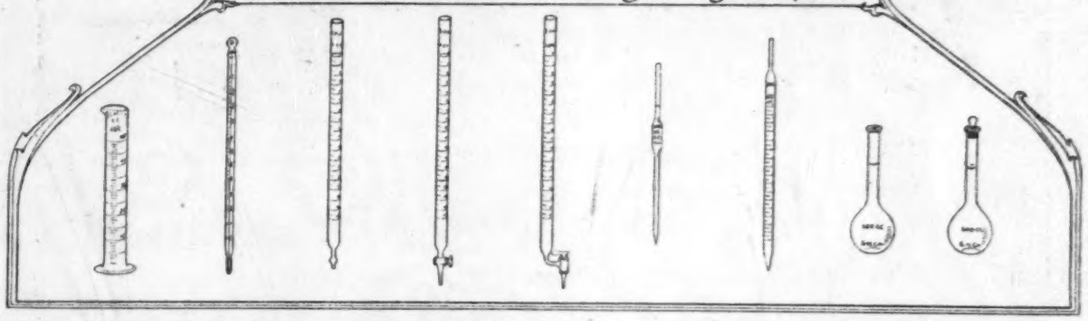

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